

### Abstract of the Disclosure

Provided is a focusing waveguide grating coupler using a leaky mode which can form single output beam while relieving the dependency on manufacturing processes. The focusing waveguide grating coupler of the present research includes: a substrate having a first refraction index  $n_1$ ; a first core layer having a second refraction index  $n_2$ , the first core layer being formed on the substrate; a second core layer having a third refraction index  $n_3$ , the second core layer being formed on the first core layer apart from the first core layer with a space  $d$  in between; a first cladding layer having a fourth refraction index  $n_4$ , the first cladding layer being formed on the second core layer; a second cladding layer having a fifth refraction index  $n_5$ , the second cladding layer being formed on the first cladding layer and inserted between the first core layer and the second core layer; and a Fresnel lens positioned on the second cladding layer, wherein the refractive indexes satisfy conditions of  $n_5 > (n_2, n_3) > n_1$  and  $n_5 > n_4$ ; and light inputted through the first and second core layers to the Fresnel lens as radiated leaky beam by a leaky mode formed according to the conditions, and the leaky beam forms an optical focus by performing single directional coupling.